

REMARKS

When last examined, Claims 1-36 and 43-50 were pending in the present application. Claims 1, 2, 5, 6, 22-24, 26, 34-36, and 47-50 are amended and new Claims 51 and 52 are added in this submission. For the reasons set forth below, Applicants respectfully submit that all claims are in condition for allowance.

Claims 1-36 and 43-50 are rejected under 35 U.S.C. §103(a) as being unpatentable over Miller et al. (6,155,699). The Examiner states:

Miller teaches a structure for a LED having a lens of various materials including TiO₂, etc and has a variety of layers including glass, phosphorescents etc. Miller in column 5 teaches alternating layers of both high and low refractive index. Given the teaching of LED, a diode, by definition is a stack of at least a p layer and and [sic] n layer, and renders obvious the claimed invention. (Office Action, page 2)

Independent Claims 1, 47, and 49 have all been amended to recite a light emitting device having a stack of layers and also comprising "a transparent lens attached to said stack by a bond effected at an interface disposed between said lens and said stack." (emphasis added). At page 10, line 23 to page 11, line 10, for example, and elsewhere the present application teaches methods by which such a bond may be formed to attach the lens to the stack. Figure 7 of the present application, for example, shows one example of an inventive light emitting device in which lens 2 is attached to LED die 4 by a bond effected at the interface of lens 2 with superstrate 34 of LED die 4.

In contrast, in the device disclosed by Miller et al. an LED die 12 positioned on a lead frame 14 is encapsulated by encapsulating layer 28, over which distributed Bragg reflector 30 and phosphorescent layer 36 are formed, and further encapsulated by the material of lens 22. (Miller et al. Figure 2 and specification column 5, line 15 to column 6, line 5). Miller et al. neither teaches nor suggests "a bond effected at an interface disposed between said lens and said stack" that attaches the lens to the LED.

One of ordinary skill in the art will recognize that in prior art devices such as that of Miller et al. the LED die is typically attached to the lead frame with a conductive adhesive prior to encapsulation of the LED die and the lead frame in the lens material. No "bond effected at an interface disposed between said lens and said stack" is required in such a device to attach the lens to the die. Moreover, in contrast to the bonding methods disclosed in the present application, Miller et al. does not disclose any method of providing "a bond effected at an interface disposed between said lens and said stack" by which the lens could be attached

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to the LED. Hence, one of ordinary skill in the art would not be motivated to modify the device disclosed by Miller et al. to provide the inventions of amended Claims 1, 47, and 49. Consequently, amended independent Claims 1, 47, and 49 are patentable over Miller et al.

Claims 2, 5, 6, 22, 23, 26, 34, and 35 have been amended to employ an alternative form of Markush group language. Additional amendments to Claims 6, 23, 24, 35, 36, 48 and 50 broaden these claims.

Claims 2-46, 48, 50, as amended, and new Claims 51 and 52 are each directly or indirectly dependent on one of independent Claims 1, 47, and 49 and hence patentable over Miller et al. for at least the reasons for which the corresponding amended independent basis claim is patentable. The additional features recited in the dependent claims further distinguish these claims over Miller et al.

Claims 3 and 4, for example, further distinguish over Miller et al. by reciting, respectively, "said lens is a Fresnel lens" and "said lens is a graded index lens." Miller et al. discloses only dome shaped lenses formed by encapsulation techniques. In contrast to the present application, Miller et al. provides no method by which a Fresnel lens or a graded index lens could be attached to an LED. Consequently, one of ordinary skill in the art could not derive the inventions of Claims 3 and 4 from the disclosure of Miller et al.

Claim 6, as amended, further distinguishes over Miller et al. by reciting "said lens is formed from a material selected from the group of zirconium oxide, sapphire, GaP, ZnS, materials containing lead oxide, and SiC." Miller et al. discloses encapsulation of an LED by "clear epoxy or glass" (column 5, line 25; also see column 6, line 7) to form a lens. One of ordinary skill in the art would recognize that the materials recited in Claim 6, as amended, do not lend themselves to encapsulation techniques as employed by Miller et al., and hence would not be motivated to modify the device of Miller et al. to provide the invention of Claim 6, as amended. In contrast, the methods provided in the present application allow the attachment of a lens formed from, for example, zirconium oxide, sapphire, GaP, ZnS, materials containing lead oxide, or SiC to a stack of layers in a light emitting device.

Amended Claims 23, 24, 35, 36, 48, and 50 also further distinguish over Miller et al. by reciting lens materials that do not lend themselves to the encapsulation techniques disclosed by Miller et al.

Claim 25 further distinguishes over Miller et al. by reciting "a transparent bonding layer disposed between said lens and a surface of said stack, said transparent bonding layer

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bonding said lens to said stack." The device of Miller et al. includes no corresponding feature.

The new claims and the amendments to the previously pending claims are supported by the originally filed application. In particular, the "materials containing lead oxide" recited in Claims 6, 23, 24, 35, 36, 48, 50, and 51 are supported by the disclosed use of Schott Glass SF59 in bonding layers and lenses. Schott glass SF59 includes lead oxide, as is shown in the material data safety sheet for Schott glass SF59 attached below as Appendix B.

For the above reasons, Applicants respectfully request reconsideration and allowance of Claims 1-36, 43-50, and new Claims 51 and 52. Should the Examiner have any questions concerning this response, the Examiner is invited to telephone the undersigned at (408) 453-9200.

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